Antimicrobial Stewardship:

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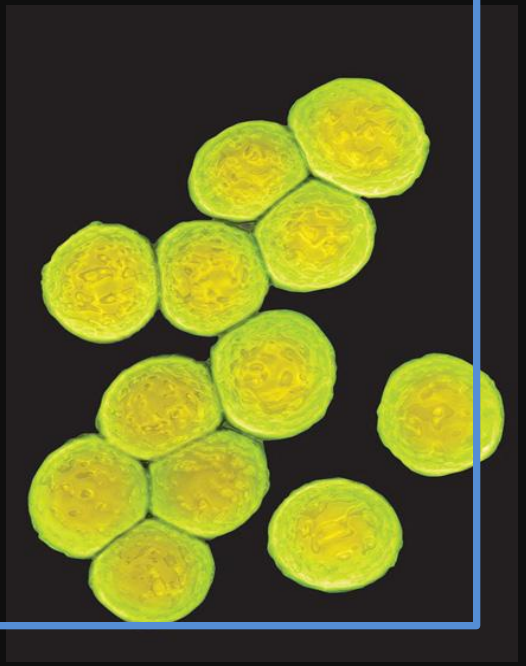
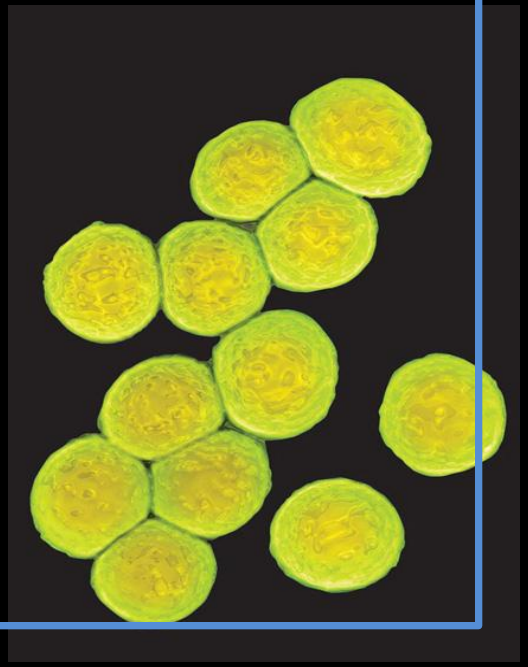


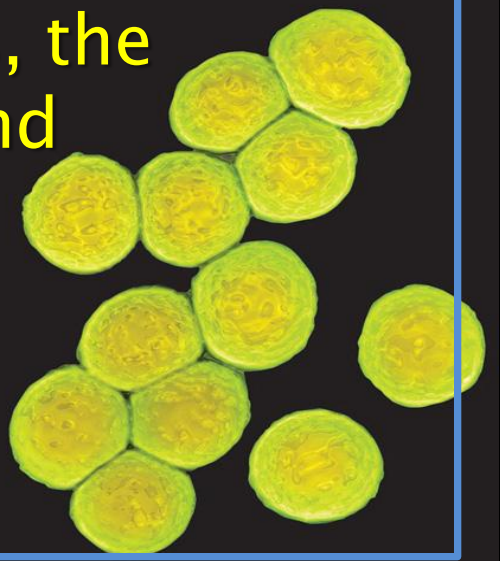
Disclosures

- Provided lectures and or consulted for, and or received research support from:
  - Astellas
  - Cubist
  - Forest
  - Pfizer
  - Rib-X
  - Triax
  - NIH
  - MDCH



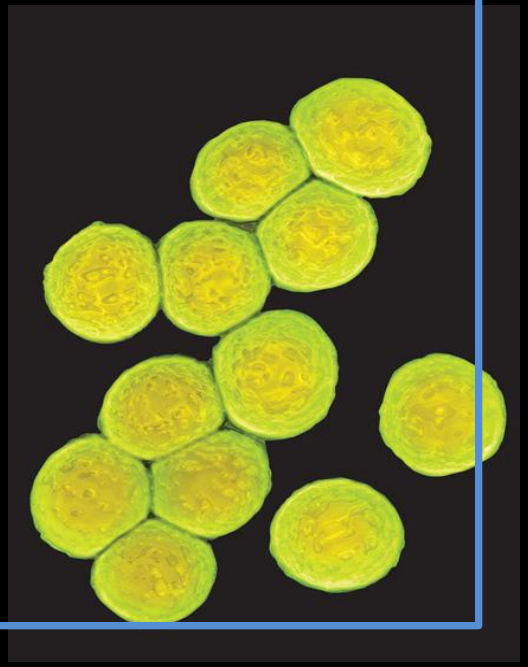
Learning Objectives

- Describe the burden of antimicrobial resistance
- Understand the basic principles of antimicrobial stewardship
- Describe the components of a successful antimicrobial stewardship program (ASP)
- Give examples of ASP interventions, the relationship to patient outcomes and control of antimicrobial resistance

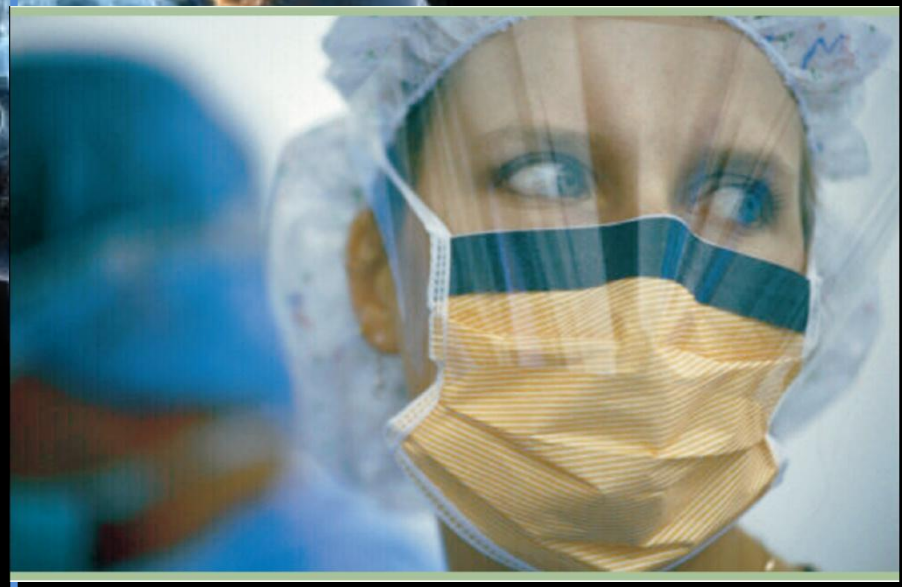


Outline

- Antimicrobial Stewardship Overview
- Applications to CAP
- Skin and Skin Structure Infections
- Future Directions



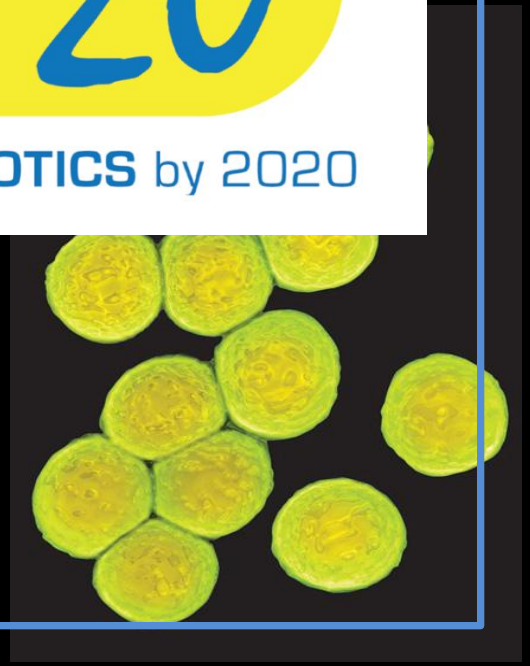
IDSA
Infectious Diseases Society of America



Bad Bugs Need Drugs

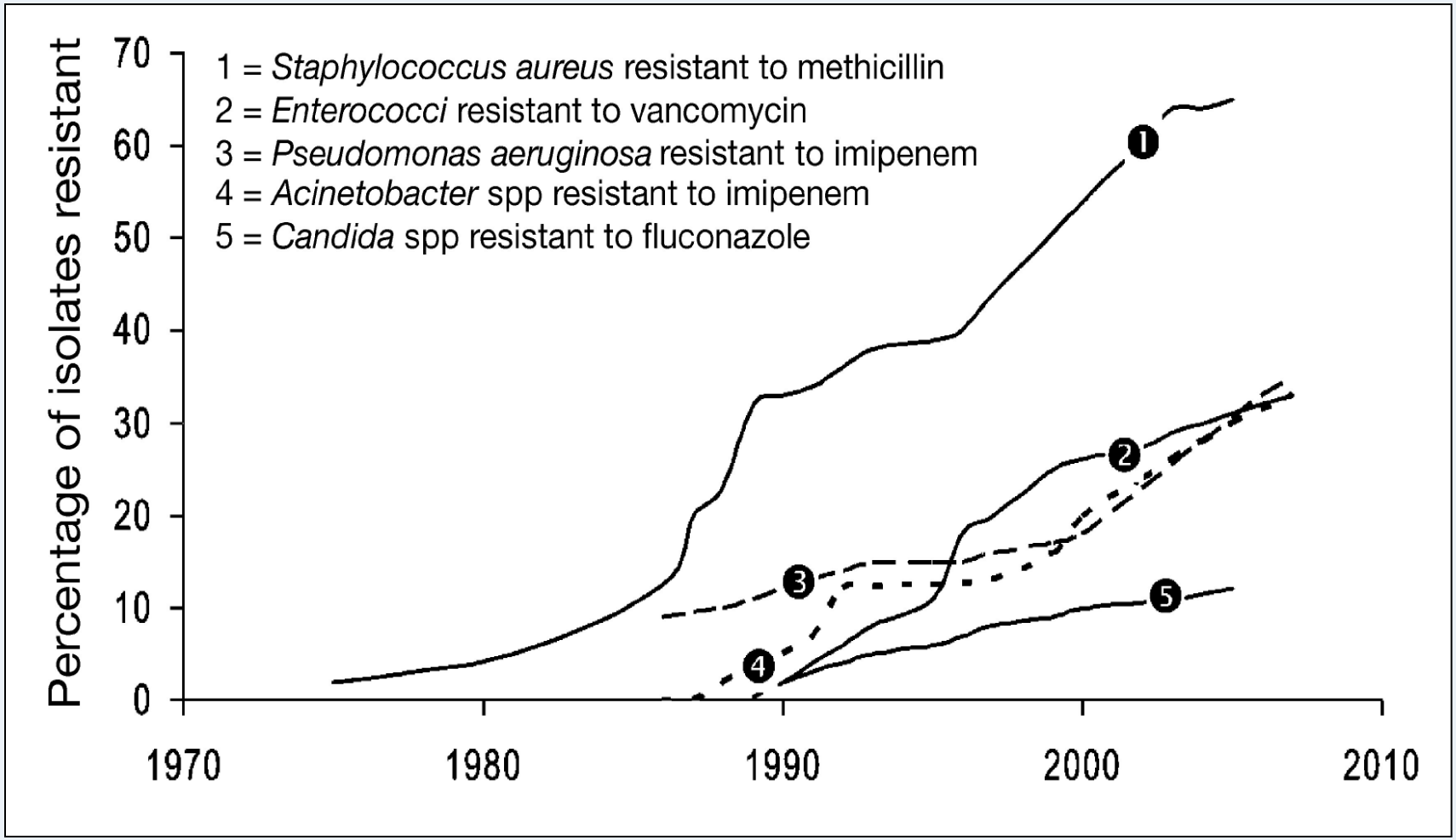
10x'20

Ten new **ANTIBIOTICS** by 2020

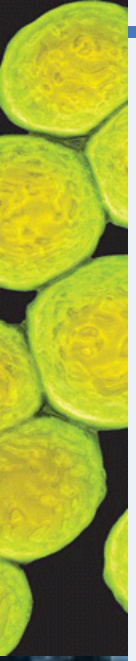


Gilbert DN., Guidos RJ., Boucher HW. et al. *Clin Infect Dis.* 2010;50:1081-83.
Talbot G. et al. *Clin Infect Dis. 2006*; 42:657-668.

Drug Resistance Rising



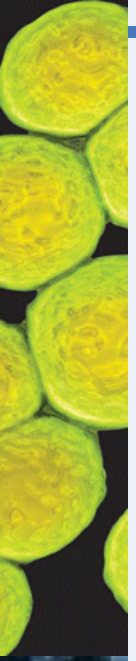
With permission from Wenzel RP et al. *Infect Control Hosp Epidemiol*. 2008;29(11): 1012-1018. © 2008 by The Society for Healthcare Epidemiology of America. Published by the University of Chicago Press.



Bad Bugs, No Drugs: A Public Health Crisis

- IDSA 2004 policy report, with periodic updates[1,2]
- Growing resistance in Gram-positive and Gram-negative pathogens, limited treatment options[1]
- Key organisms: "ESKAPE"[1]
  - ***E****nterococcus faecium*
  - ***S****taphylococcus aureus*
  - ***K****lebsiella pneumoniae*
  - ***A****cinetobacter baumanii*
  - ***P****seudomonas aeruginosa*
  - ***E****nterobacter* species

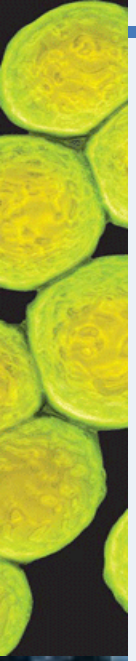
1. Boucher HW et al. *Clin Infect Dis*. 2009;48(1):1-12.
2. Rice LB. *J Infect Dis*. 2008;197(8):1079-1081.



Impact of Drug-resistant Pathogens (methicillin-resistant *S aureus*)

- Inappropriate therapy, fewer alternatives[1,2]
- Poor outcomes
  - Higher mortality[1,2]
  - Prolonged hospitalization[3]
  - Increased difficulty with placement of an extended care facility
  - Need of isolation precautions (may negatively impact on quality of patient care)
  - Increased costs[3]

1. Whitby M. et al. *Med J Aust*. 2001;175(5):264-267.
2. Cosgrove SE et al. *Clin Infect Dis*. 2003;36)1):53-59.
3. Lode HM. *Clin Microbiol Infect*. 2009;15(3):212-217.



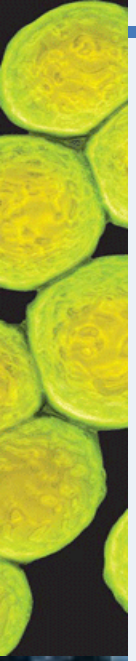
The Burden of Antimicrobial Resistance

Impacts both clinical and economic outcomes

Outcomes	Methicillin-susceptible *S. aureus*[1]	Methicilin-resistant *S. aureus*[1]	Imipenem-susceptible *P. aeruginosa*[2]	Imipenem-resistant *P. aeruginosa*[2]
Mortality	6.7%	20.7%[b]	16.7%	31.1%[a]
Hospital charges	$73,165	$118,414[c]	$48,381	$81,330[d]

[a] Relative risk: 1.86; 95% CI, 1.38-2.51.
[b] $P = .003$.
[c] $P = .03$.
[d] $P < .001$.

1. Cosgrove SE. *Clin Infect Dis*. 2006;(42 Suppl 2):S82-S89.
2. Lautenbach E. et al. *Infect Cont Hosp Epidemol*. 2006;27(9)893-900.



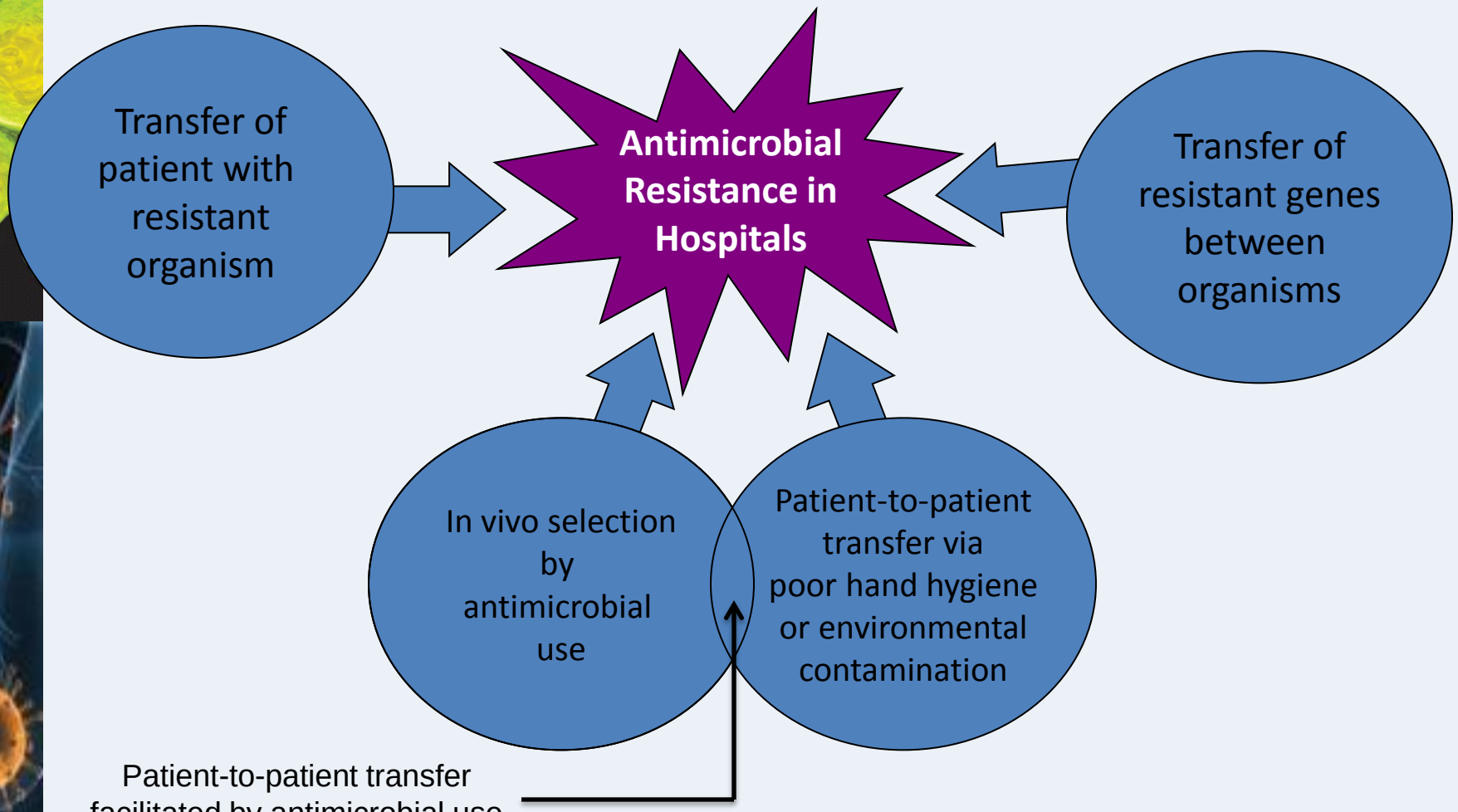
The Cost of Resistance

- Clinical outcomes associated with antimicrobial-resistant infections (ARI)
  - 6.5% attributable mortality
  - Twice as likely to die vs. uninfected
  - LOS increase of 11 days
- Economic outcomes associated with ARI[1]
  - Attributable cost: $18,588 – $29,069
  - Combined hospital and societal cost for 188 patients = $13.35 – $18.75 million
- Extrapolated nationwide: $16.6 – $26 billion annually

LOS, length of stay.

1. Roberts RR et al. *Clin Infect Dis*. 2009;49:1175-1184.
2. Association for the Prudent Use of Antibiotics: Available at: www.tufts.edu/med/apua/. Accessed October 6, 2011.

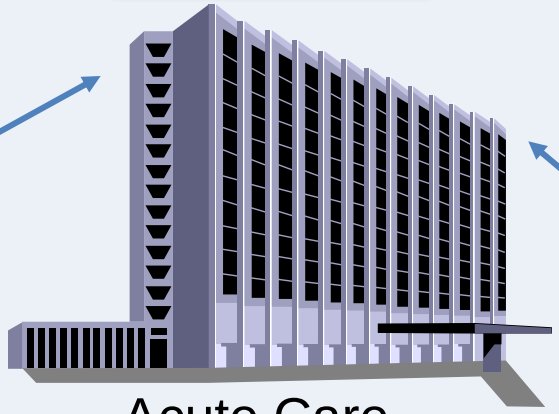
Resistance Is Multifactorial
Stewardship Is Only Part of the Solution



Paterson DL. *Clin Infect Dis.* 2006;42:S90-5.

Integrated Healthcare Systems

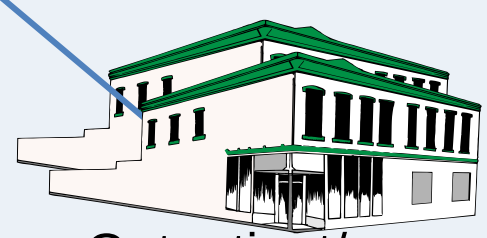
Resistance



Acute Care Facility

Resistance

Home Care

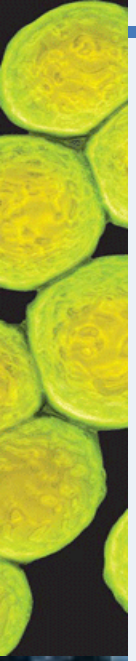


Outpatient/ Ambulatory Facility

Resistance

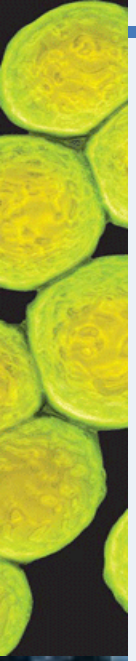
Long Term Care Facility

Resistance



Pathogenesis of HAI

- Usually bacterial infection
- Colonization usually precedes infection
  - Both colonized and infected patients are contagious
- Bugs are spread from patient to patient by healthcare workers
  - Hands, equipment (eg stethoscope)
  - Transient colonization most common
- Role of environment
- Major risks: indwelling devices, debilitated state
  - More frequent contact with HCW, higher risk
- Prevention: hand hygiene, contact precautions, patient isolation, cohorting
- Example, methicillin-resistant *Staphylococcus aureus* (MRSA)

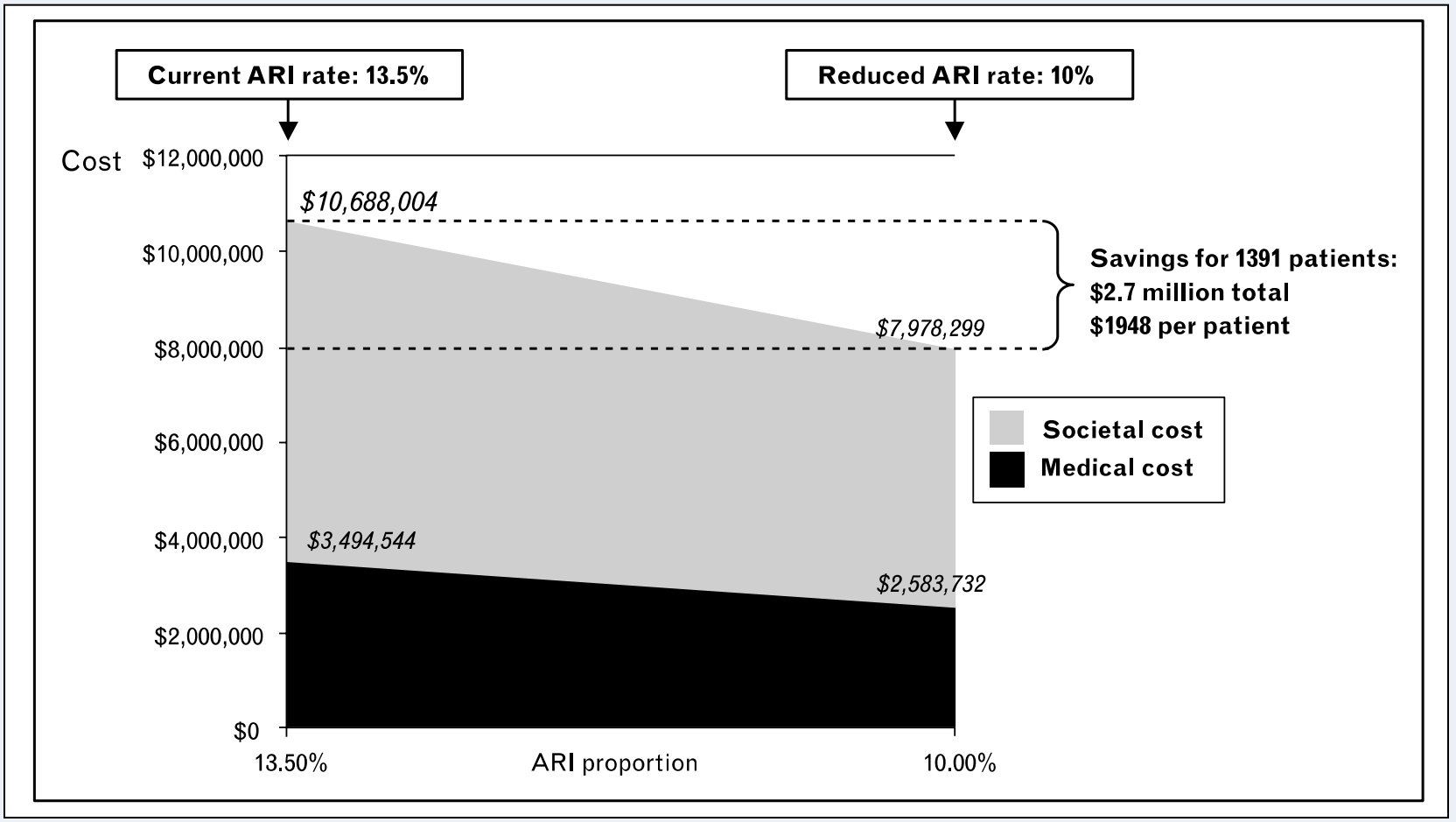


Direct effect of antimicrobials on acquisition

- Enterobacter spp. and 3rd generation cephalosporins
- Avoid Cephalosporin use: emergence of resistance in 20-25% of instances.
- In the setting of 3rd generation cephalosporins, AmpC hyperproducing Enterobacter rapidly emerge
- Direct antimicrobial pressure causes resistance: initial isolate cephalosporin-susceptible; second isolate resistant

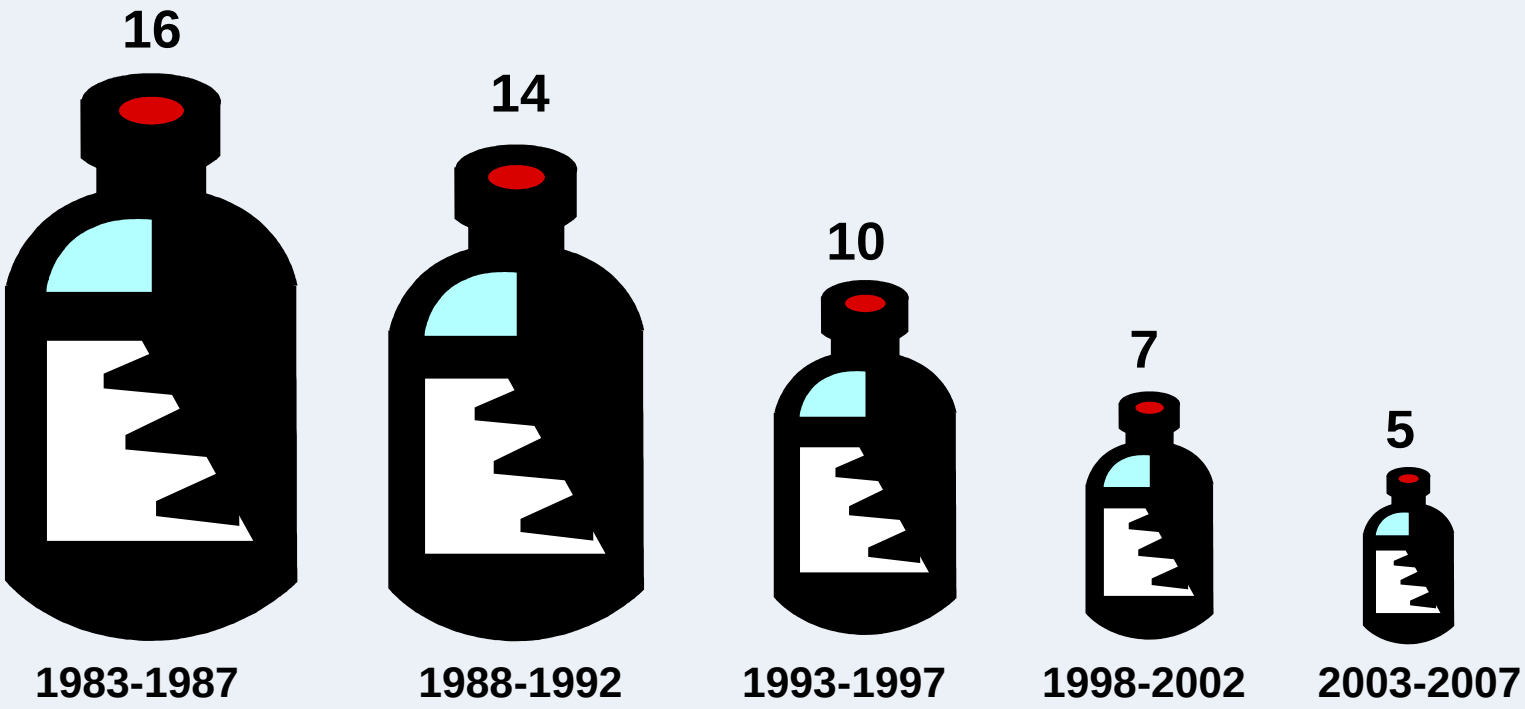
Kaye et al, Antimicrob Agents Chemother. 2001 Sep;45(9):2628-30

Projected Cost Savings if Antimicrobial Resistance Rates Reduced from 13.5% to 10%

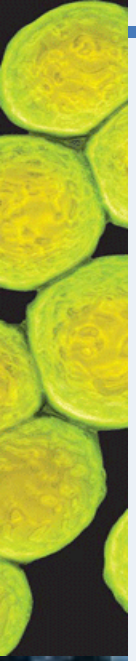


Roberts RR et al. Hospital and societal costs of antimicrobial-resistant infections in a Chicago teaching hospital: implications for antibiotic stewardship. *Clin Infect Dis*. 2009;49:1175-1184. By permission of Oxford University Press.

Declining Development of New Antimicrobials



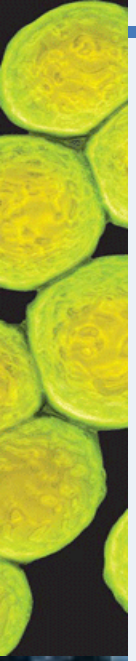
Boucher HW et al. *Clin Infect Dis*. 2009;48:1-12.



Misconceptions about Antibiotics

- Fallacies that promote “spiraling empiricism”
  - Broader is better
  - Failure to respond is failure to cover
  - When in doubt, change drugs, or add another
  - More disease(s), more drugs
  - Sickness requires immediate treatment
  - Response implies diagnosis
  - Bigger disease, bigger drugs
  - Bigger disease, newer drugs
  - Antibiotics are nontoxic

Reprinted from Kim JH, Gallis HA. Observations on spiraling empiricism: its causes, allure, and perils, with particular reference to antibiotic therapy. *Am J Med*. 1989;87(2):201-206. Copyright 1989, with permission from Elsevier.

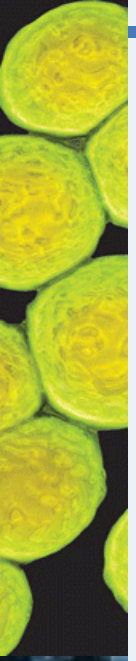


Antibiotic Stewardship Fundamentals

- Definition
  - "An ongoing effort…to optimize antimicrobial use in order to improve patient outcomes, ensure cost-effective therapy, and reduce adverse sequelae of antimicrobial use (including antimicrobial resistance)"
- Axioms/Assumptions
  - Antibiotic prescribing behaviors can be changed
  - Antibiotic use drives antibiotic resistance
  - Reduced antibiotic use decreases resistance or slows its increase
  - Appropriate antibiotic use improves patient outcomes and reduces costs

MacDougall C et al. *Clin Microbiol Rev*. 2005;18(4):638-656.

The Antibiotic Use Thought Process = Antimicrobial Stewardship



Assess patient → **Make diagnosis** → **Select treatment plan**

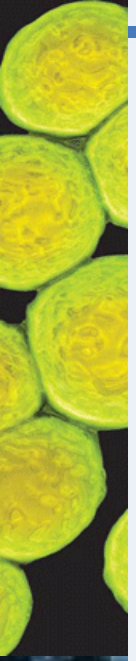
Are antibiotics needed?
What are my options?
Formulary restrictions?
Will it work?

Risk stratification (severity, risk factors for MDROs)
Guidelines (local or national)
Spectrum of activity and local antibiogram
Nonscientific inputs: peer opinion, marketing

Implement plan → **Reassess patient** → **Modify plan**

Are antibiotics still needed?
Can I streamline therapy?
Specific microbiology
Convenience and cost

Guidelines Can Assist in the Development of Antimicrobial Stewardship



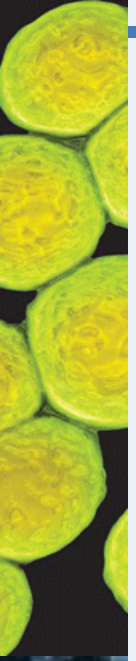
GUIDELINES

Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship

Timothy H. Dellit,[1] Robert C. Owens,[2] John E. McGowan, Jr.,[3] Dale N. Gerding,[4] Robert A. Weinstein,[5] John P. Burke,[6] W. Charles Huskins,[7] David L. Paterson,[8] Neil O. Fishman,[9] Christopher F. Carpenter,[10] P. J. Brennan,[9] Marianne Billeter,[11] and Thomas M. Hooton[12]

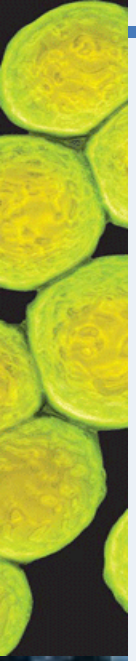
[1]Harborview Medical Center and the University of Washington, Seattle; [2]Maine Medical Center, Portland; [3]Emory University, Atlanta, Georgia; [4]Hines Veterans Affairs Hospital and Loyola University Stritch School of Medicine, Hines, and [5]Stroger (Cook County) Hospital and Rush University Medical Center, Chicago, Illinois; [6]University of Utah, Salt Lake City; [7]Mayo Clinic College of Medicine, Rochester, Minnesota; [8]University of Pittsburgh Medical Center, Pittsburgh, and [9]University of Pennsylvania, Philadelphia, Pennsylvania; [10]William Beaumont Hospital, Royal Oak, Michigan; [11]Ochsner Health System, New Orleans, Louisiana; and [12]University of Miami, Miami, Florida

Dellit TH et al; Infectious Diseases Society of America; Society for Healthcare Epidemiology of America. *Clin Infect Dis*. 2007;44(2):159-177.



The Rationale and Methods for Stewardship Programs Have Been Well Described

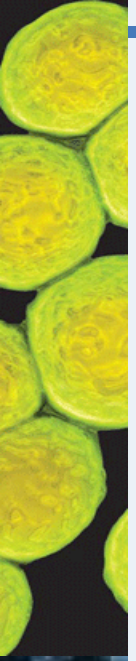
- Fishmnan N., Srinivasan A. Antimicrobial Stewardship 2012: Science Driving Practice. *Infect Control Hosp Epidemiol*. 2012;33:319-21.
- Bartlett JG. A call to arms: the imperative for antimicrobial stewardship. *Clin Infect Dis*. 2011;53(Suppl 1):S4-S7.
- File Jr TM, Solomkin JS, Cosgrove SE. Strategies for improving antimicrobial use and the role of antimicrobial stewardship programs. *Clin Infect Dis.* 2011;53 (Suppl 1):S15-S28.
- Septimus EJ, Owens Jr RC. Need and potential of antimicrobial stewardship in community hospitals. *Clin Infect Dis.* 2011;53(Suppl 1):S9-S14.
- IDSA/SHEA Guidelines for developing an institutional program to enhance antimicrobial stewardship. *Clin Infect Dis*. 2007;44:159-177.
- Fishman N. Antimicrobial stewardship. *Am J Med*. 2006;119:S53-S61.
- Paterson DL. The role of antimicrobial management programs in optimizing antibiotic prescribing within hospitals. *Clin Infect Dis*. 2006;42:S90-S95.
- MacDougall C, Polk RE. Antimicrobial stewardship programs in health care systems. *Clin Micro Rev*. 2005;18:638-656.
- Owens RC, Fraser GL, Stogsdill P. Antimicrobial stewardship programs as a means to optimize antimicrobial use. *Pharmacotherapy*. 2004;24:896-908.



Goals of Antimicrobial Stewardship

- Optimize clinical outcomes while minimizing[1,2] unintended consequences of antimicrobial use
  - Optimize antimicrobial therapy in each patient and in the population (PK/PD considerations)
- Unintended consequences include the following[1,2]
  - Toxicity
  - Selection of pathogenic organisms (eg, *C. difficile*)
  - Emergence of resistant pathogens

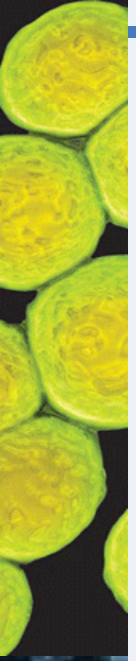
1. MacDougall C et al. *Clin Microbiol Rev*. 2005;18(4):638-656.
2. Ohl CA et al. *Clin Infect Dis*. 2011; 53(Suppl 1):S23-S28.



Other Important Aspects of Antimicrobial Stewardship

- The appropriate use of antimicrobials is an essential part of patient safety
- Comprehensive infection control is essential to reduce spread of resistant organisms
- Stewardship should also reduce healthcare costs without adversely impacting clinical outcomes

Dellit TH et al; Infectious Diseases Society of America; Society for Healthcare Epidemiology of America. *Clin Infect Dis*. 2007;44(2):159-177.

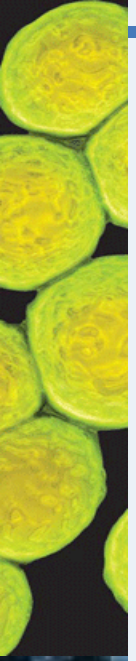


Reasons for Uncertainty

- Variable implementation
  - Restrictions common in academic centers, not community hospitals
  - Role of pharmacist, physician, ID fellow unclear and varies
  - Limited use of local guidelines
  - Limited use of CPOE and CDSS
  - Program funding inconsistent
  - Administrative support and data analysis inconsistent

CPOE, computerized provider order entry; CDSS, clinical decision support system.

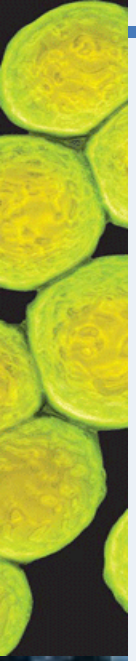
Barlam TF et al. *ICHE*. 2006;27:695-703.



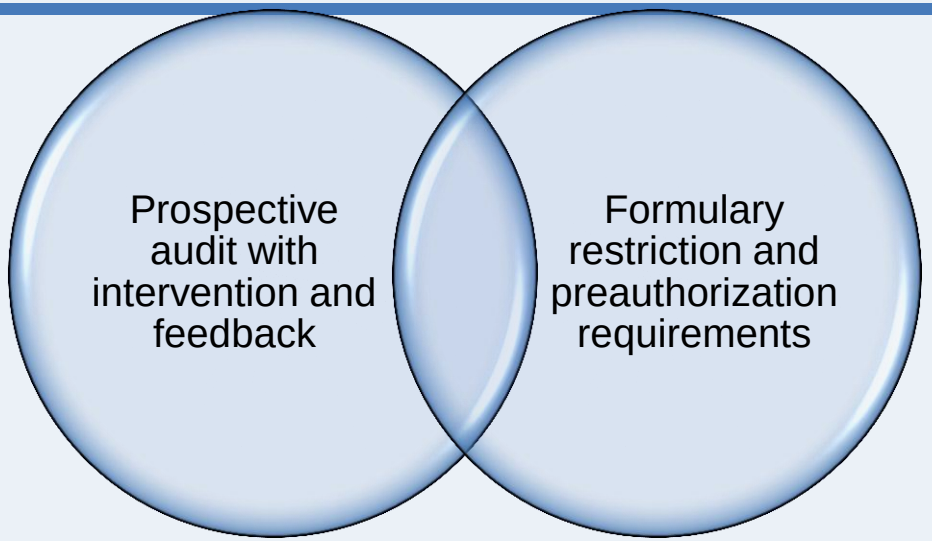
Two Proactive Core Strategies

- **Prospective audit with intervention and feedback**
  - Can increase appropriate use of antimicrobials
  - Incorporates streamlining/de-escalation
    - Culture- and susceptibility-based
    - Eliminates redundant therapy
- **Formulary restriction and preauthorization**
  - Can lead to immediate and significant reductions in antimicrobial use and cost
  - As a means of controlling antimicrobial resistance is less clear (and) may simply shift to an alternative agent with resulting increased resistance

Dellit TH et al; Infectious Diseases Society of America; Society for Healthcare Epidemiology of America. *Clin Infect Dis*. 2007;44(2):159-177.



"Back-End Approach"



"Front-End Approach"

Advantages:
- Can be customized to the facility
- Preserves the prescribers autonomy
- Can be facilitated through computer surveillance
- Circumvents potential for delays in initiating therapy

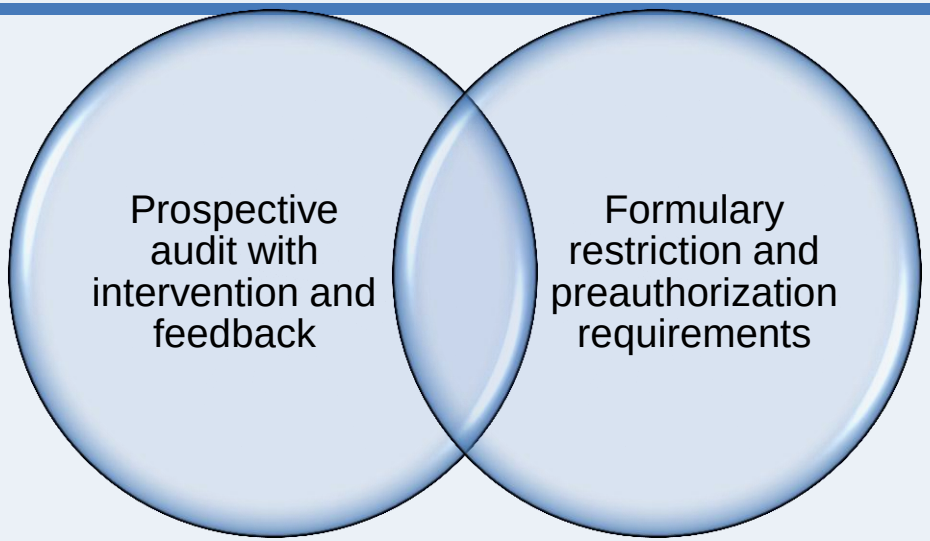
Disadvantages:
- Recommendations are optional
- Potential for inappropriate exposure

Advantages:
- Initial orders funneled through experts
- Immediate educational opportunities
- Control of antimicrobial use

Disadvantages:
- Delay in therapy for critically ill patients
- Labor intensive
- Loss of prescriber autonomy

Dellit TH et al; Infectious Diseases Society of America; Society for Healthcare Epidemiology of America. *Clin Infect Dis*. 2007;44(2):159-177.

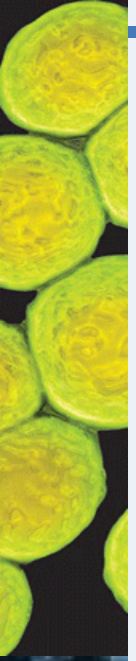
“Back-End Approach”



“Front-End Approach”

Education	• **Most frequently employed intervention** • **Essential element of any antimicrobial stewardship program (ASP)**
Guidelines	• **ASP should facilitate development of evidenced-based guidelines** • **Must be tailored to local practice and epidemiology**
Computer Surveillance	• **Opportunity for screening information as it becomes available** • **Can develop alerts, reports, and decision support pathways**
Outcomes Measurement	• **Determines the impact of new policies** • **Opportunities for research and publication**

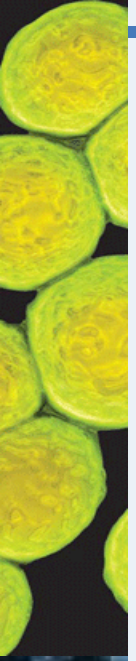
Dellit TH et al; Infectious Diseases Society of America; Society for Healthcare Epidemiology of America. *Clin Infect Dis*. 2007;44(2):159-177.



Stewardship Strategies: Restrictive Formularies

- There is no totally “open” or “closed” formulary, just varying degrees of restriction
- May help control costs
- Unknown if restriction may increase selective pressure (and therefore increase resistance)
- Puts pharmacy in a “police” role, drains ID Staff
- Need mechanism to avoid delay in therapy
- Generally a “front end” approach, therefore limited impact on duration of therapy

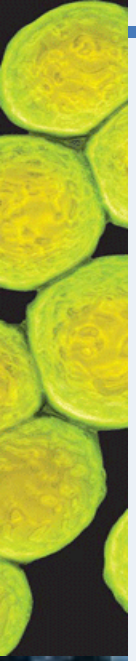
Dellit TH et al; Infectious Diseases Society of America; Society for Healthcare Epidemiology of America. *Clin Infect Dis*. 2007;44(2):159-177.



Stewardship Strategies: Criteria Monitored Drug Program

- Target drugs prescribed for specific patient indications
  - Prescribing outside criteria requires ID approval
- Criteria determined by ID physicians and pharmacy
- Literature support for recommendations
- Pharmacist and/or ID physicians may be monitoring service

Dellit TH et al; Infectious Diseases Society of America; Society for Healthcare Epidemiology of America. *Clin Infect Dis*. 2007;44(2):159-177.



Stewardship Strategies: Therapeutic Guidelines and Pathways

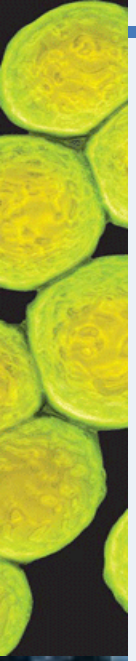
- Disease-based treatment guidelines to target:
  - Selection: initial empiric therapy and alternatives
  - Dosing: pharmacodynamic/Pharmacokinetic optimization
  - Route: IV/PO conversions
  - De-escalation of therapy
  - Duration of therapy, facilitate discharge from hospital
- Must have multidisciplinary involvement and input from all stakeholders (eg, surgery, pulmonary, nurse managers…)
- Should account for local resistance patterns

Dellit TH et al; Infectious Diseases Society of America; Society for Healthcare Epidemiology of America. *Clin Infect Dis*. 2007;44(2):159-177.

Antibiogram Example – Miracle University Hospital

Miracle University Hospital
01/01/08 - 12/31/08
Percent Susceptible

2008 ICU's: A4E1/A4E2, A5E, ACC1/ACC2/ACC3, CV2A2B/3A, NCC1/NCC2																		
GRAM-NEGATIVE AEROBES	total isolates, all sites	Cefazolin	Cefotetan	Cefotaxime	Ceftazidime	Ceftraixone	Cefepime	Amikacin	Gentamicin	Tobramycin	Aztreonam	Imipenem	Meropenem	Ciprofloxacin	Levofloxacin	Ampicillin/sulbactam	Ampicillin	Piperacil/tazobactam	Trimeth/sulfa (SXT)
MIC breakpoint(ug/ml)		≤8	≤16	≤8	≤8	≤8	≤8	≤16	≤4	≤4	≤8	≤4	≤4	≤1	≤2	≤8	≤8	≤16	≤2/38
Acinetobacter calcoaceticus+ #	87			2	11	2	36		48	54		40		32	32	57			35
Citrobacter freundii complex	35			77	77	77	100		97	100		100	100	94	94				
Enterobacter aerogenes + #	68			79	79	79	100	100	100	100	86	100	100	100	100			80	100
Enterobacter cloacae + #	130			71	71	71	97	100	93	93	74	100	100	91	91			78	90
Escherichia coli	486	90	99	96	94	96	97	99	89	92	95	100	100	76	76	62	53	97	78
Klebsiella oxytoca	68	67	100	92	92	92	100	100	100	100	96	100	100	100	100	70		82	100
Klebsiella pneumoniae	276	91	99	94	94	94	94	100	95	94	92	100	100	94	94	82		96	90
Proteus mirabilis	120	90	100	99	99	99	99	100	94	95	93		100	62	75	85	77	100	69
Pseudomonas aeruginosa +	318				74		76	94	89	97		62	69	69	69			84*	
Serratia marcescens + #	63		98	98	98	98	100	100	100	100	94	95	100	85	94			92	100
Stenotrophomonas maltophilia	65																		93
+ = dual antibiotic coverage with an aminoglycoside recommended for systemic infections, # = cephalosporins not advocated as first-line or primary agents, *≤ 64, **1st Rx																			

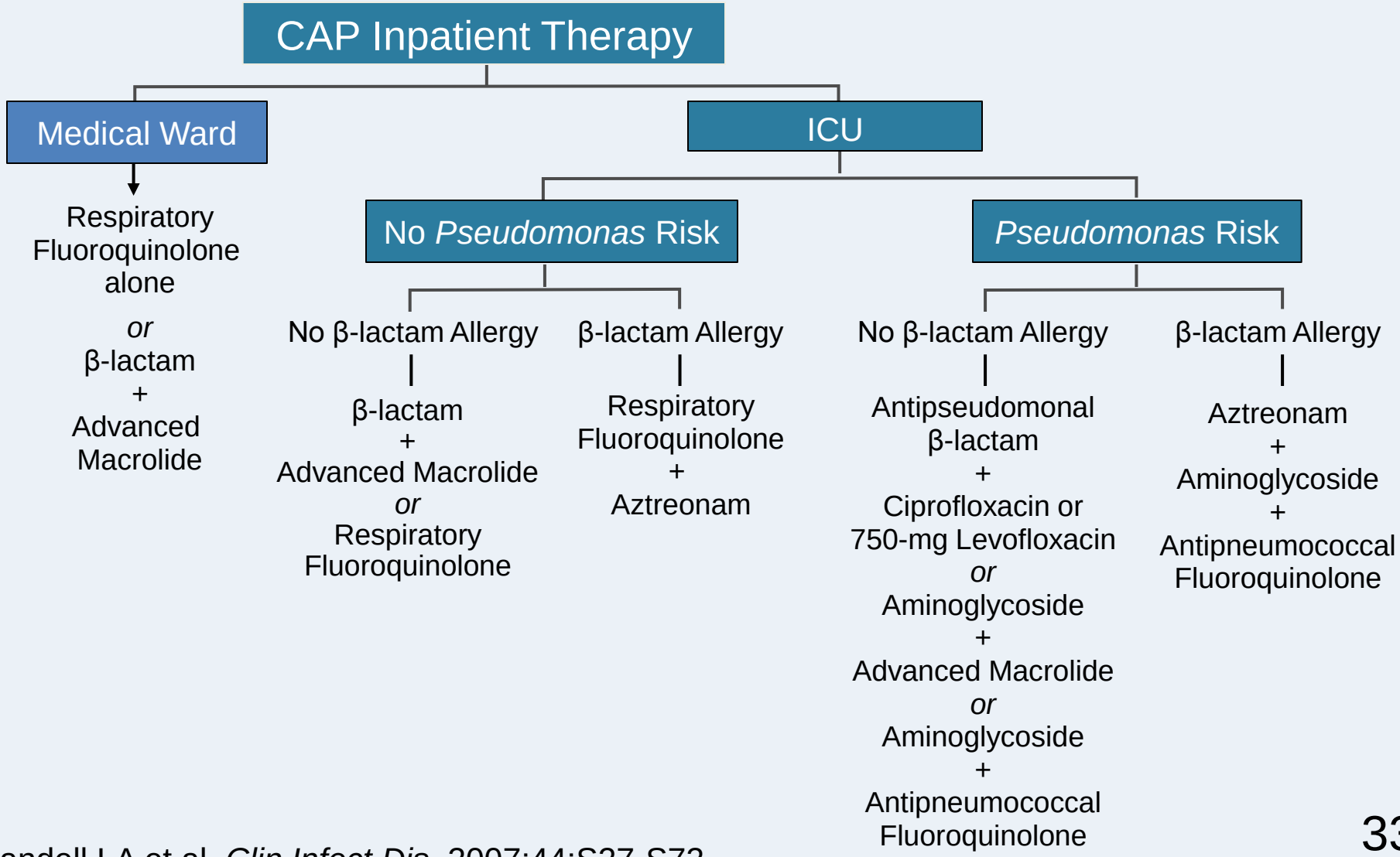


Antimicrobial Stewardship and the Treatment of CABP

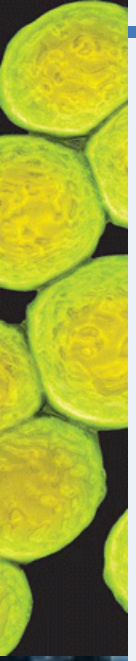
- Guidelines and Pathways are an effective tool for applying antimicrobial stewardship principles
- Guideline-recommended antimicrobial therapy for established by IDSA and ATS
  - Addresses three populations of patients
    - Outpatients
    - Non-ICU inpatients
    - ICU patients

ATS, American Thoracic Society; IDSA, Infectious Diseases Society of America.
Mandell LA et al. *Clin Infect Dis*. 2007;44:S27-S72.

2007 IDSA/ATS Treatment Guidelines for Inpatient Management of CAP



Mandell LA et al. *Clin Infect Dis*. 2007;44:S27-S72.

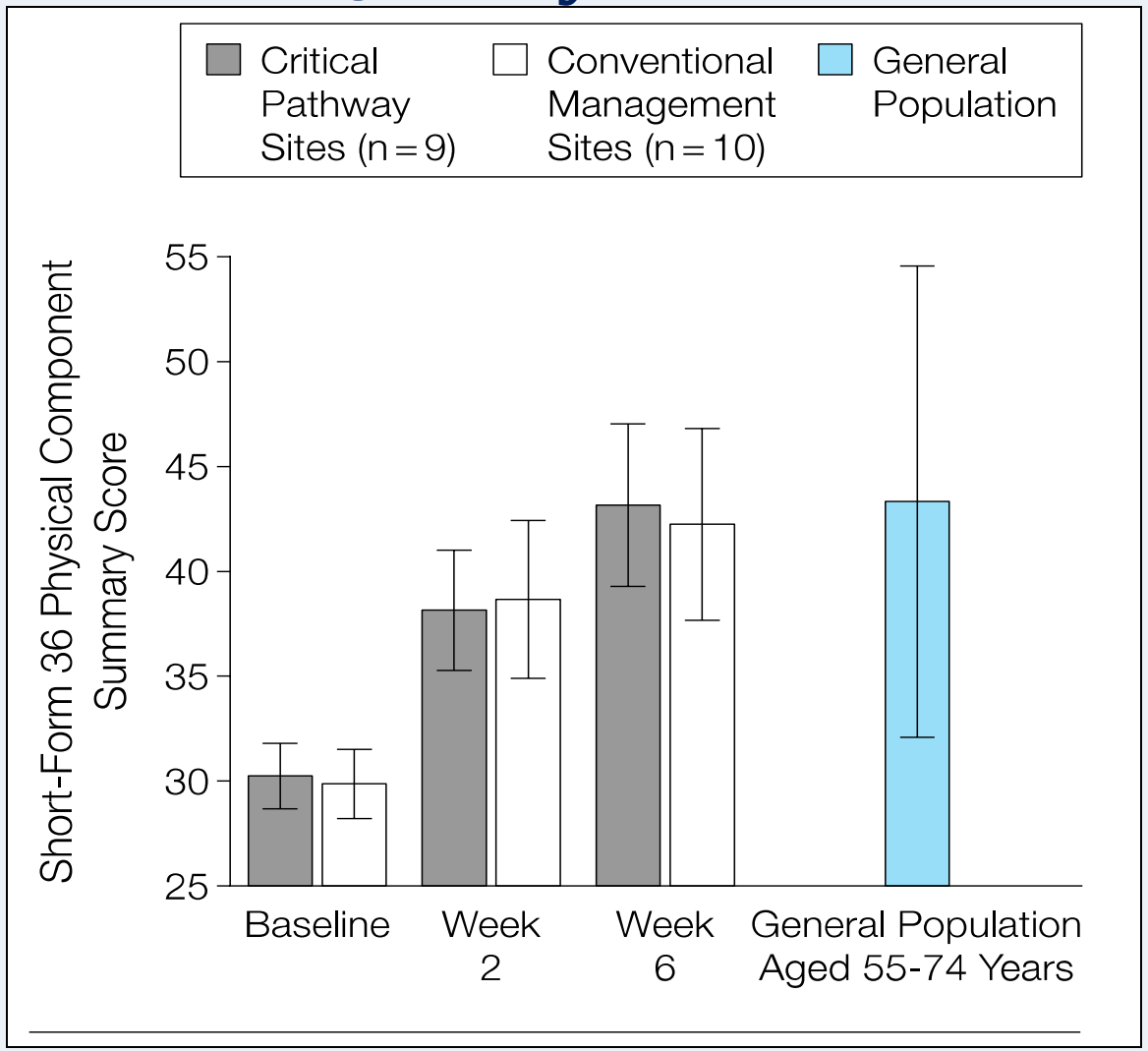


Guidelines and Pathways: Support for Antibiotic Stewardship in CABP

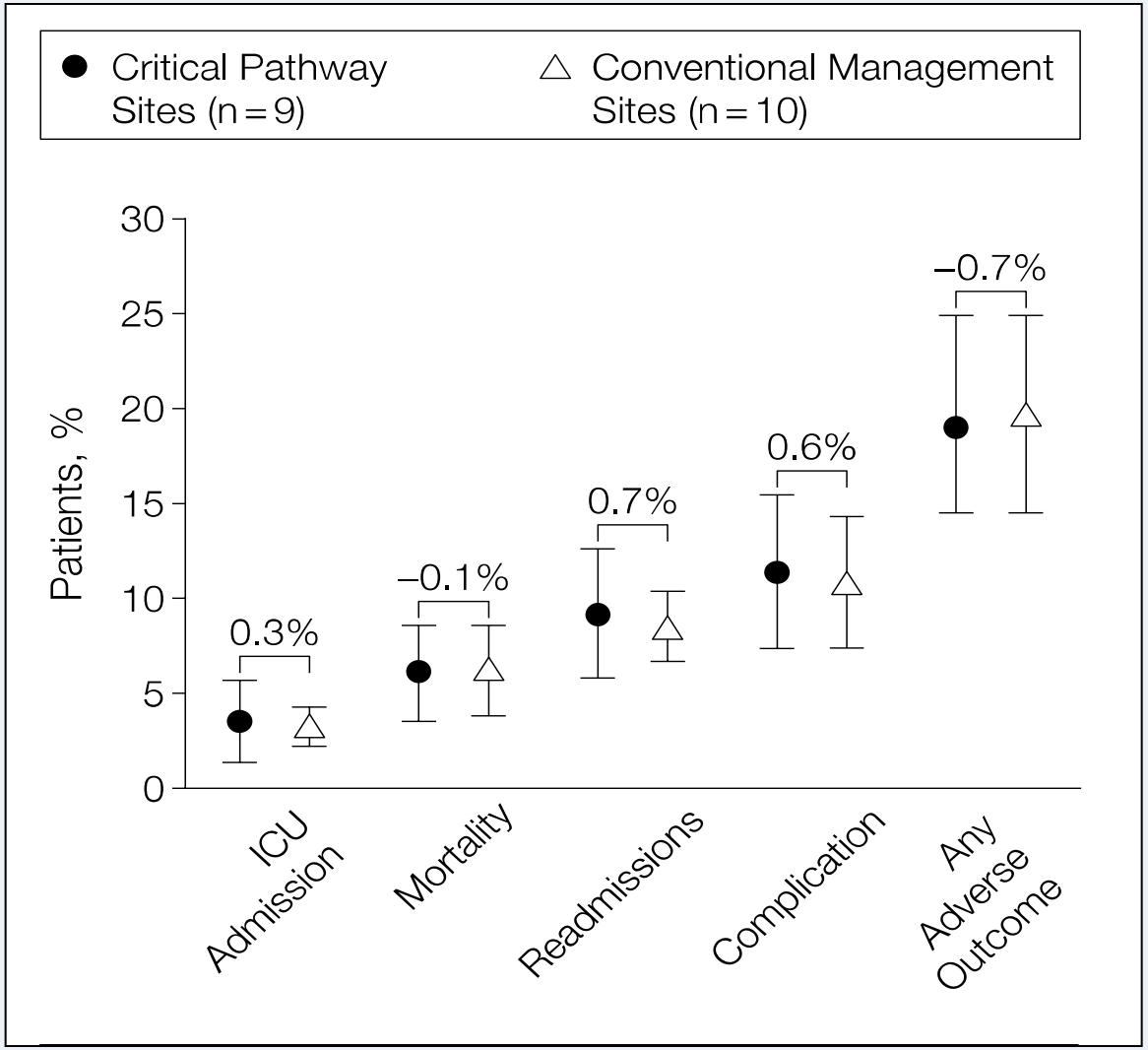
- Evaluation of a critical pathway in EDs of 19 hospitals
  - Multicenter, randomized controlled trial
  - Clinical prediction rule to guide
    - Hospital admission
    - Practice guidelines
    - Use of levofloxacin
- Results
  - 1743 CABP patients studied
  - Compared with conventional therapy, implementation of pathway led to
    - 1.7-day reduction in median LOS (4.4 vs. 6.1; *P* = .04)
    - 1.7-mean day reduction of IV therapy (4.6 vs. 6.3; *P* = .01)
    - More likely to receive monotherapy (64% vs. 27%; *P* < .001)

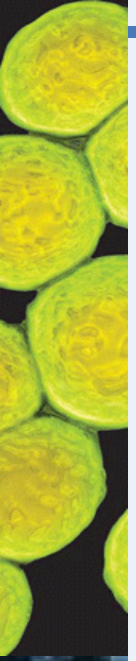
Marrie T et al. *JAMA*. 2000;283:749-755.

Critical Pathway Versus Conventional Management and Quality of Life



Critical Pathway Versus Conventional Management and Clinical Outcomes



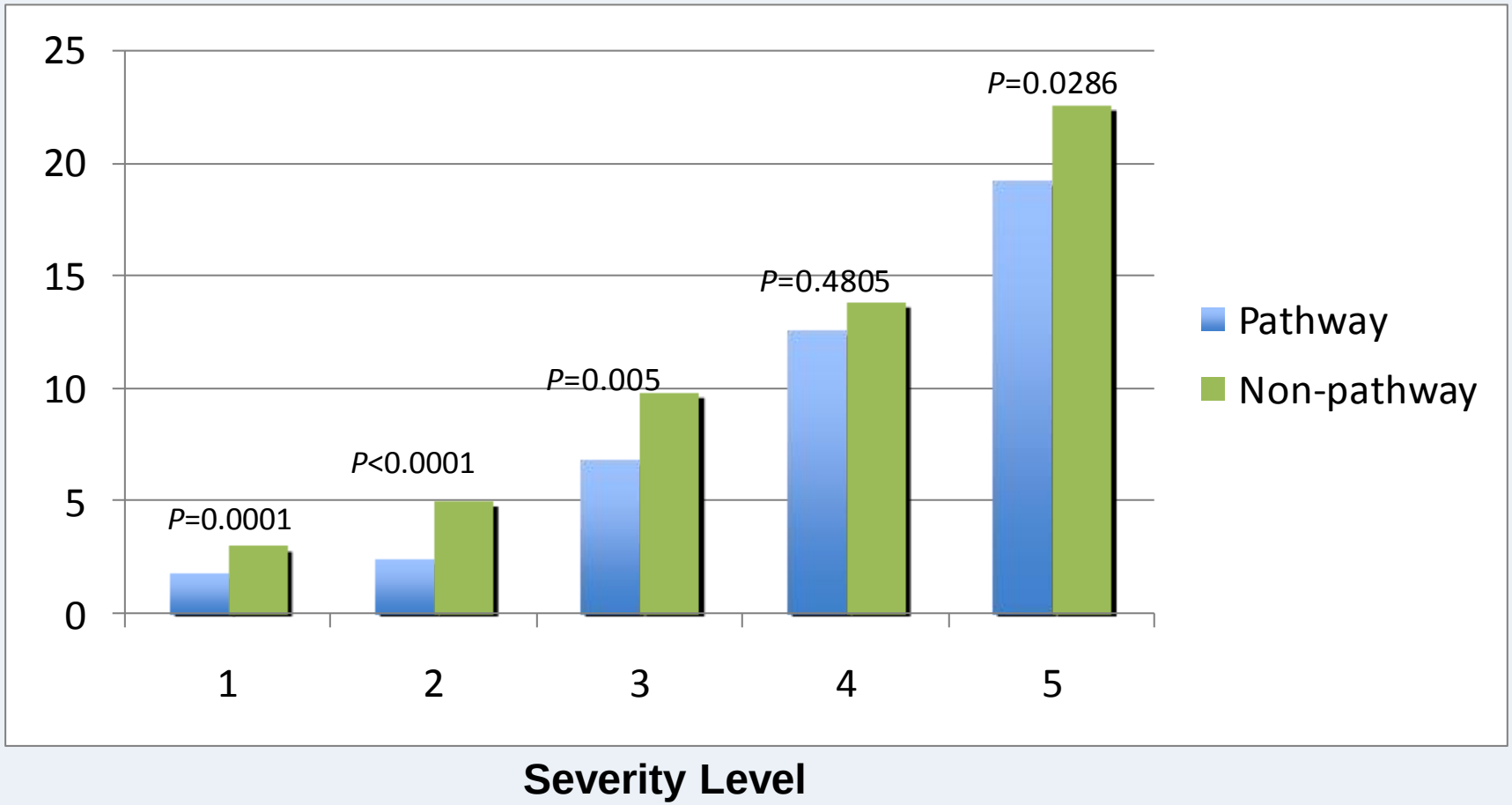


Use of Evidence-Based Guidelines and Pathways: Support for ASP in CABP

- Retrospective cohort study: 22,196 CABP patients
- 31 Adventist Health System institutions
- Patients enrolled in the clinical pathway:
  - ~50% more likely to receive blood cultures and appropriate therapy
  - 80% reduction in the likelihood of respiratory failure requiring mechanical ventilation (OR, 0.20; 95% CI, 0.12-0.33)
  - Significantly lower mortality rate (OR, 0.37; 95% CI, 0.2-0.7)

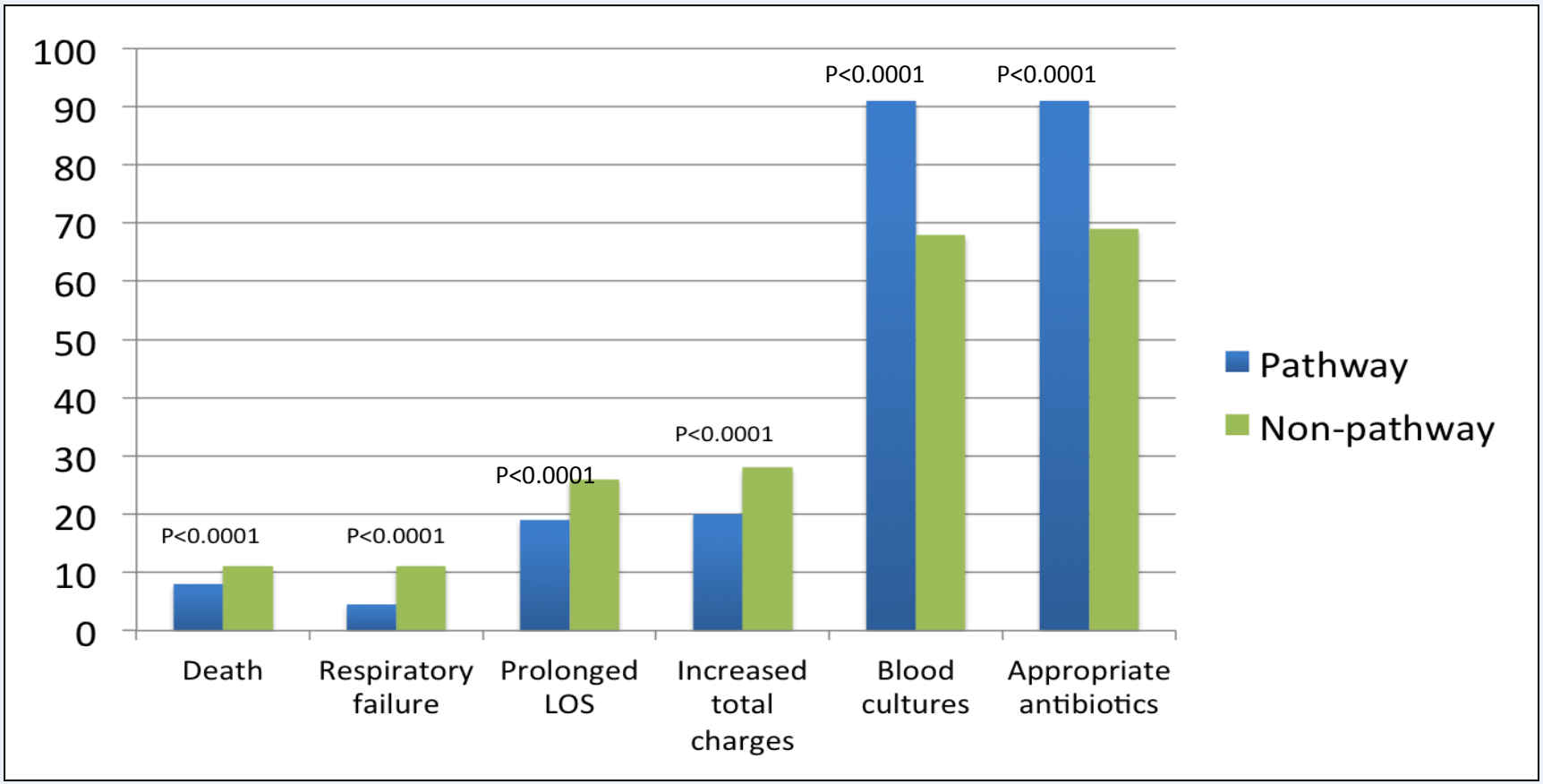
Hauck LD et al. *Ann Epidemiol.* 2004;14(9):669-675.

Mortality by Pathway Status and Pneumonia Severity Level

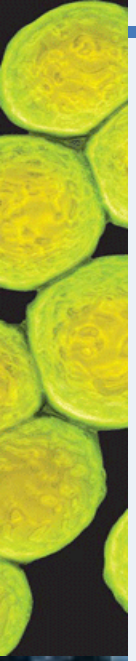


Reprinted from Hauck LD et al. Clinical pathway care improves outcomes among patients hospitalized for community-acquired pneumonia *Ann Epidemiol.* 2004;14:669-675. Copyright 2004. With permission from Elsevier .

Outcomes on CABP Pathway Versus Non-pathway



Reprinted from Hauck LD et al. Clinical pathway care improves outcomes among patients hospitalized for community-acquired pneumonia *Ann Epidemiol.* 2004;14:669-675. Copyright 2004. With permission from Elsevier .

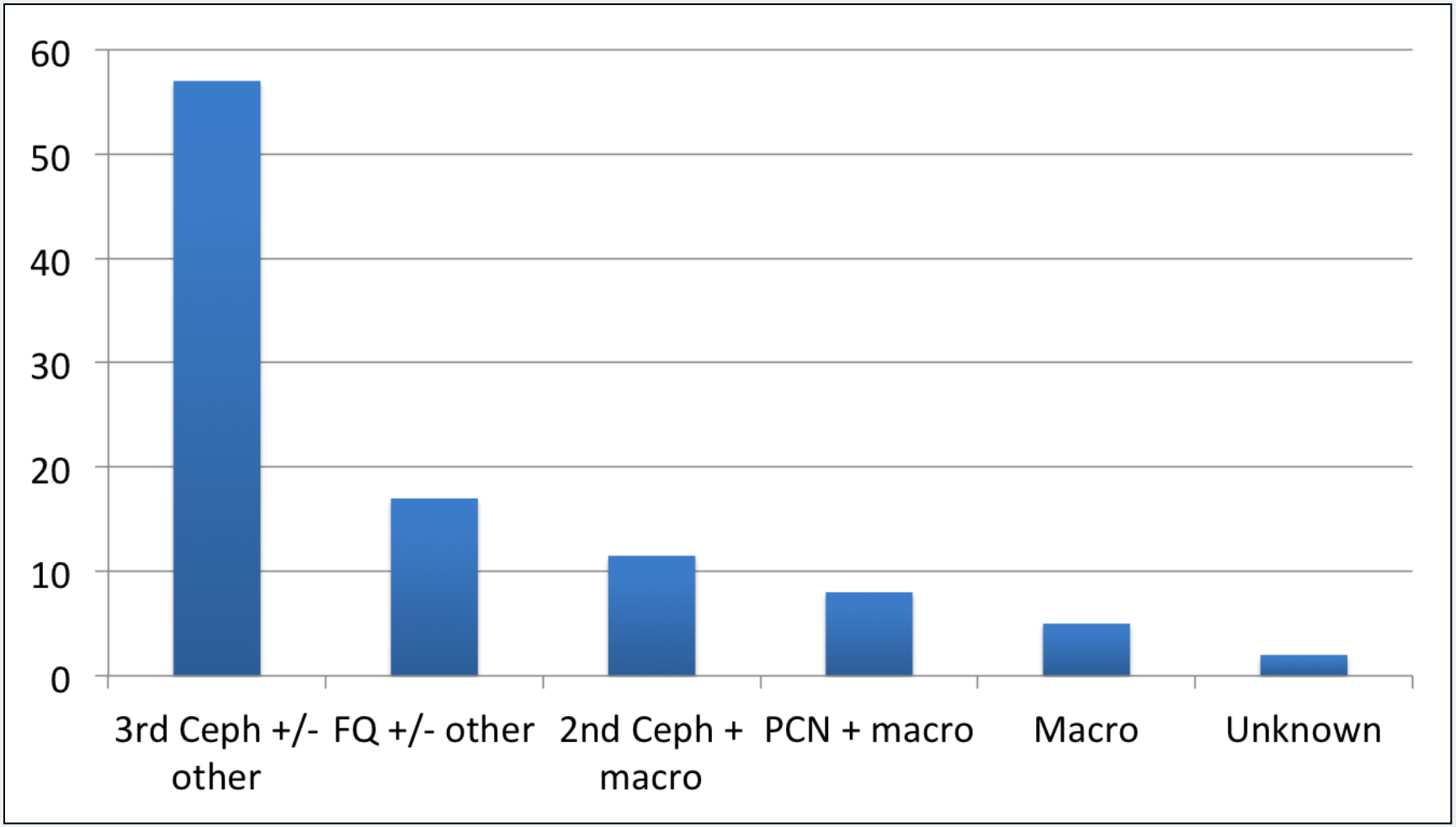


Impact of Compliance with CABP Guidelines

- Prospective evaluation of adherence to 1998 IDSA guidelines for treatment of inpatients with CABP
- Conducted in 46 Veterans Health Administration Hospitals
- Results
  - Compliance with antibiotic selection:
    - 85.3% (592/694) for patients admitted to general ward
    - Only 40% (26/65) patients admitted to ICU
  - Modification of antibiotic regimen was 83.8%
    - 69.5% of changes were IV to PO conversions
  - Authors concluded that greater use of treatment guidelines increase use of early switch from IV to PO therapy

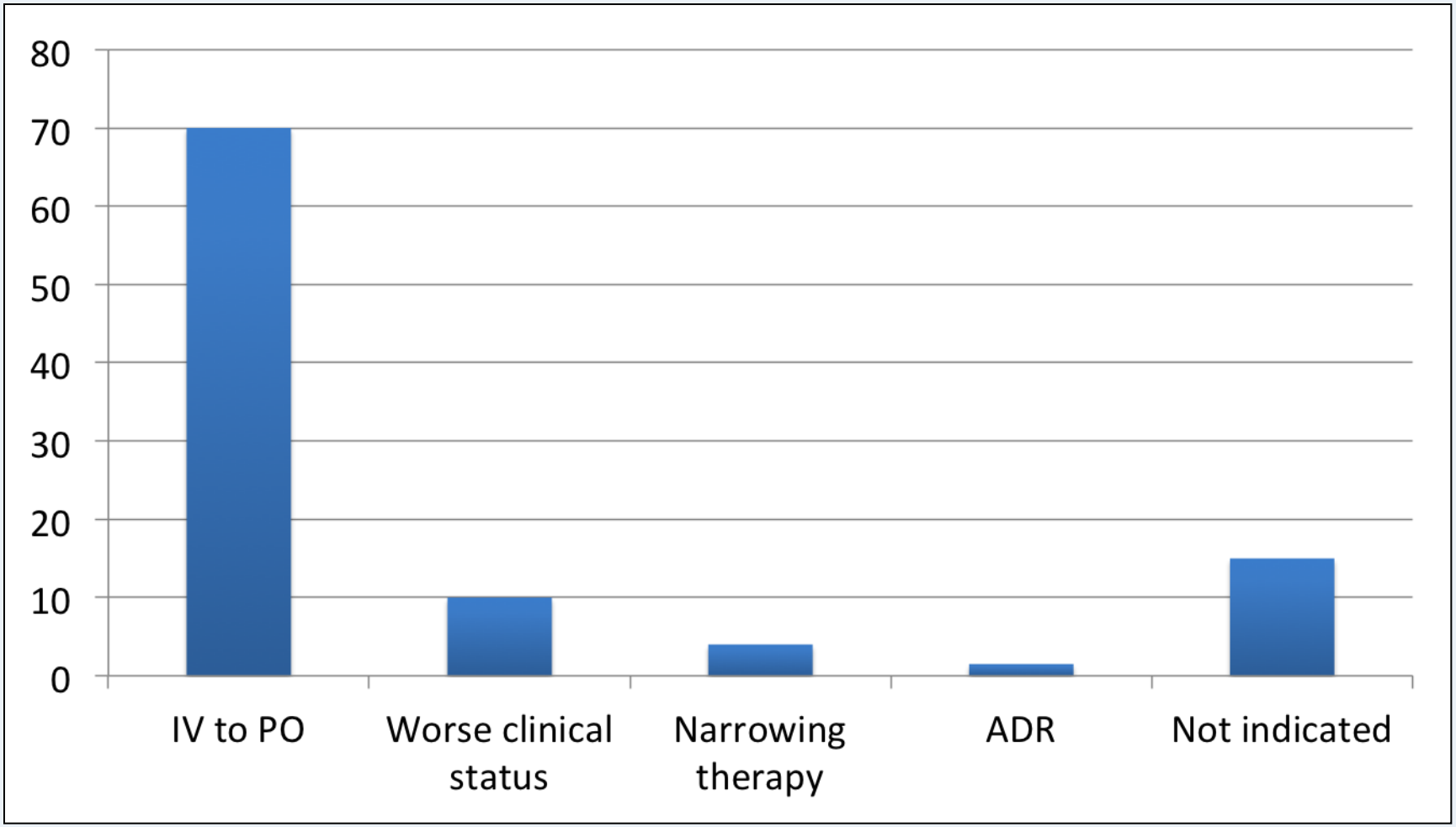
Davydov L et al. *Diag Microbiol Infect Dis*. 2006;54:267-275.

Initial Antibiotic Selection



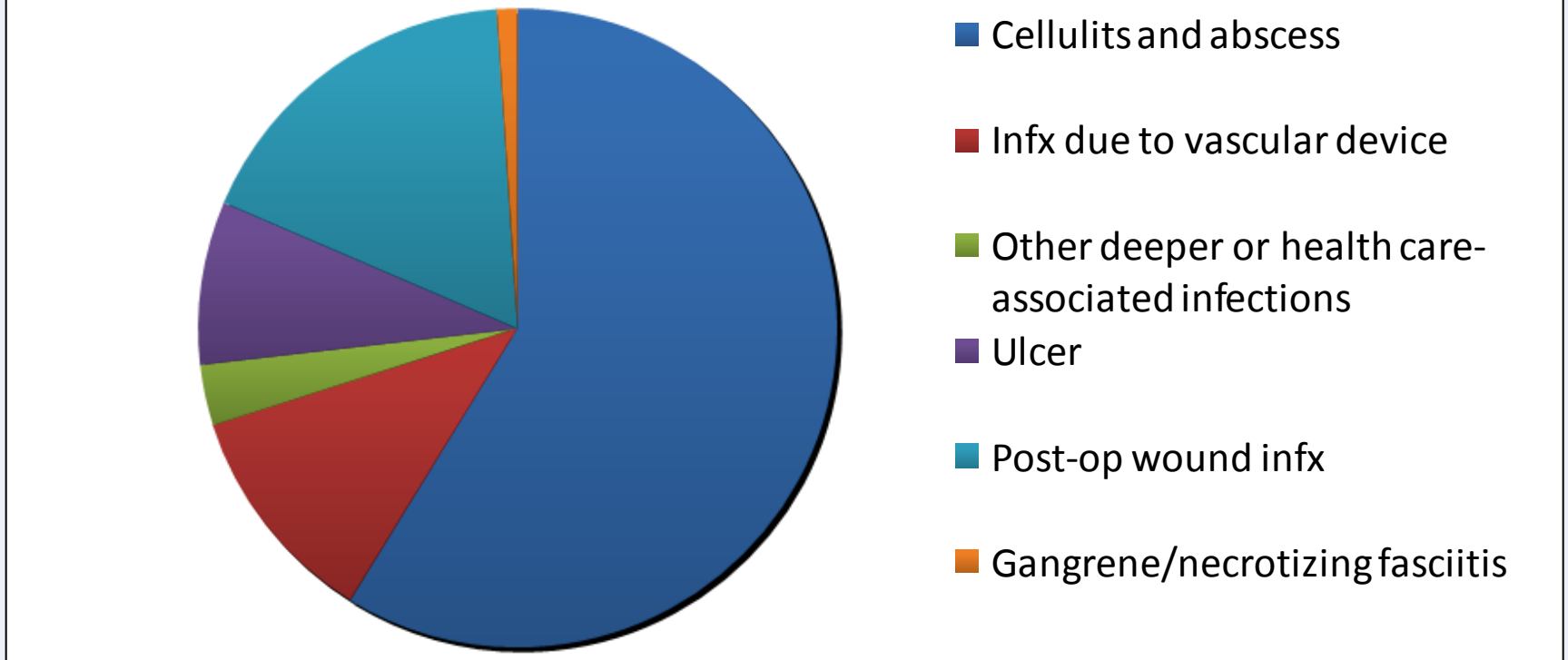
Reprinted from Davydov L et al. Prospective evaluation of the treatment and outcome of community-acquired pneumonia according to the Pneumonia Severity Index in VHA hospitals *Diagn Microbiol Infect Dis*. 2006;54:267-275. Copyright 2006. With permission from Elsevier.

Reasons for Antibiotic Change



Reprinted from Davydov L et al. Prospective evaluation of the treatment and outcome of community-acquired pneumonia according to the Pneumonia Severity Index in VHA hospitals *Diagn Microbiol Infect Dis*. 2006;54:267-275. Copyright 2006. With permission from Elsevier.

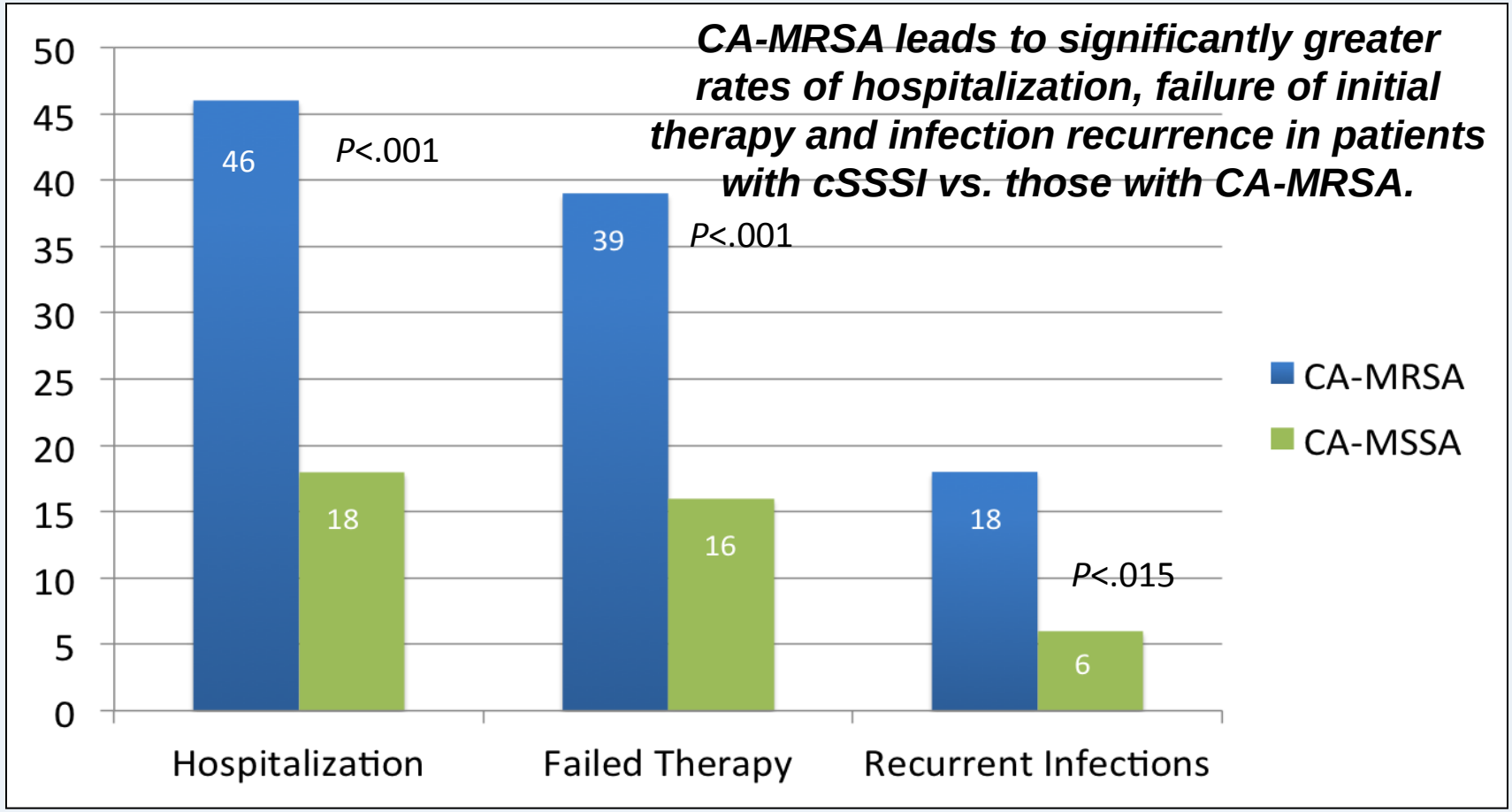
Antimicrobial Stewardship and Skin and Soft Tissue Infections (SSTIs)



Note: All included in definition of complicated SSSI (cSSSI) except other superficial infections and gangrene/necrotizing fasciitis.

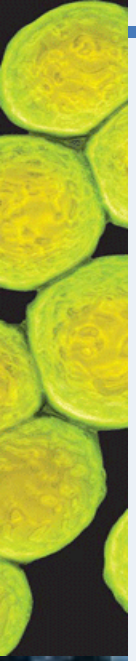
Edelsberg J et al. *Emerg Infect Dis*. 2009;15(9):1516-1518.

Antibiotic Resistance and Treatment Outcomes



CA-MRSA, community-acquired methicillin resistant *S. aureus*;
CA-MSSA, community-acquired methicillin-sensitive *S. aureus.*

Davis SL et al. *J Clin Microbiol*. 2007;45(6):1705-1711.

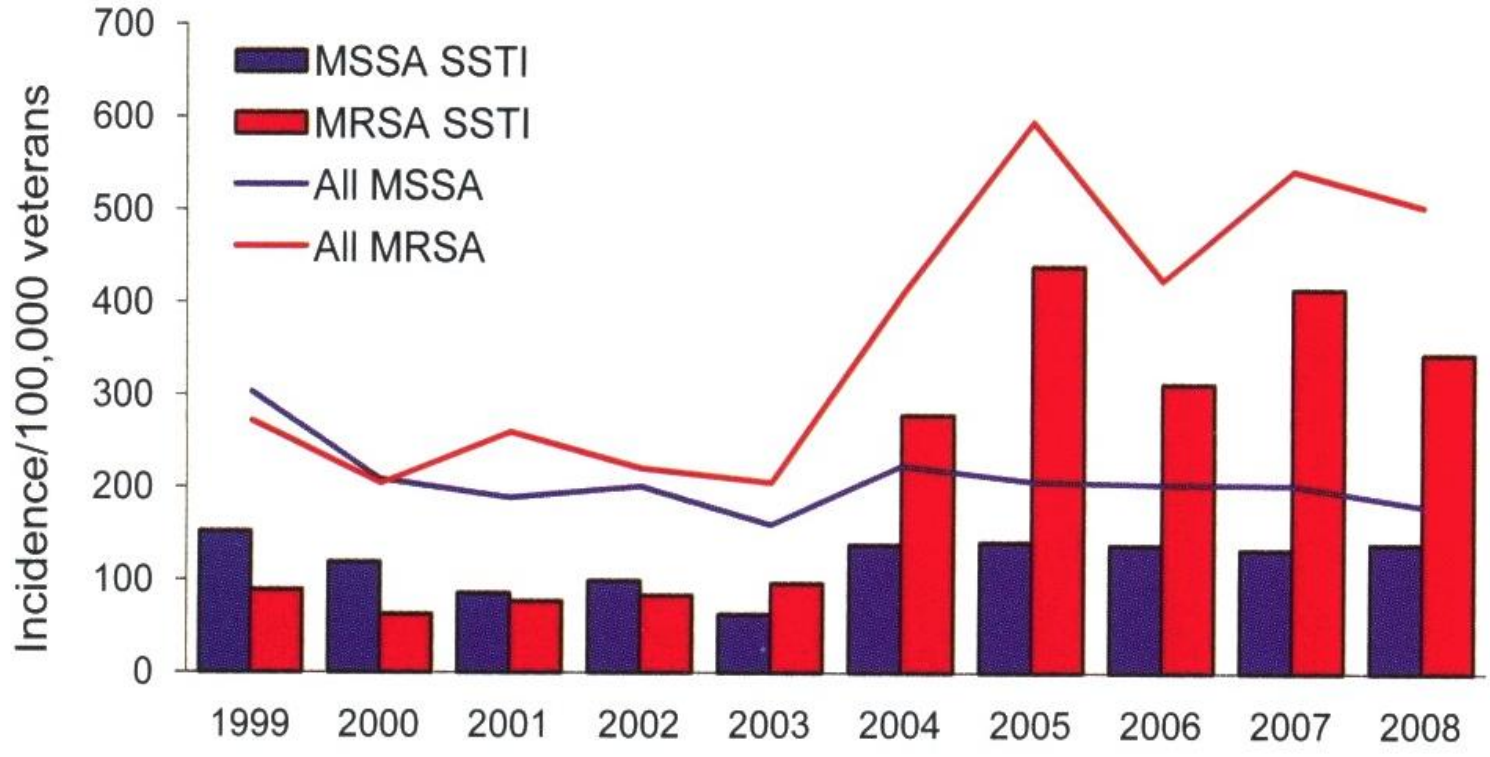


S. aureus Infections in US Veterans, Maryland, 1999-2008

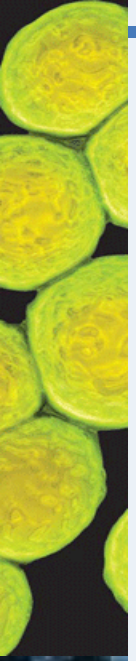
- Collected all *S. aureus* positive blood and clinical culture data from 1999-2008 from 3 VA Medical Centers
  - Defined unique culture as 1st culture within 6-month period
  - Classified on
    - Methicillin susceptibility
    - Community or hospital onset
- Classified cultures from sterile or non-sterile body site according to CDC defined criteria
- Collected all ICD-9-CM codes associated with culture
- Defined invasive or non-invasisve *S. aureus* infection on basis of isolation from specific body site:
  - Invasive: sterile body site (ie, blood, pleural fluid, CSF, etc.)
  - Noninvasive: nonsterile site within concurrent culture from as sterile site

Tracy LA et al. *Emerg Infect Dis.* 2011;17(3):441-448.

S. aureus Infections in US Veterans, Maryland, 1999-2008



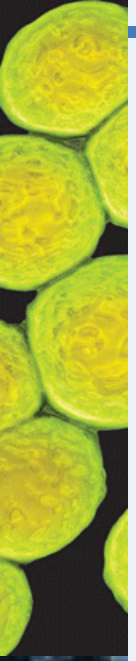
Tracy LA et al. *Staphylococcus aureus* infections in US veterans, Maryland, USA, 1999–2008. *Emerg Infect Dis.* 2011;17(3):441-448.



S. aureus Infections in US Veterans, Maryland, 1999-2008

- Conclusions
  - Overall incidence of *S. aureus* infections increased from 1999-2008
  - Driven by a rapid increase in community-onset MRSA skin and soft tissue infections
  - Increase was striking after 2003, and coincides with the time that USA300 became a major contributor to noninvasive *S. aureus* infections
  - Data suggested a shift in the distribution of *S. aureus* infections to noninvasive community-onset MRSA

Tracy LA et al. *Emerg Infect Dis.* 2011;17(3):441-448.



MRSA: A Common Cause of ABSSSI

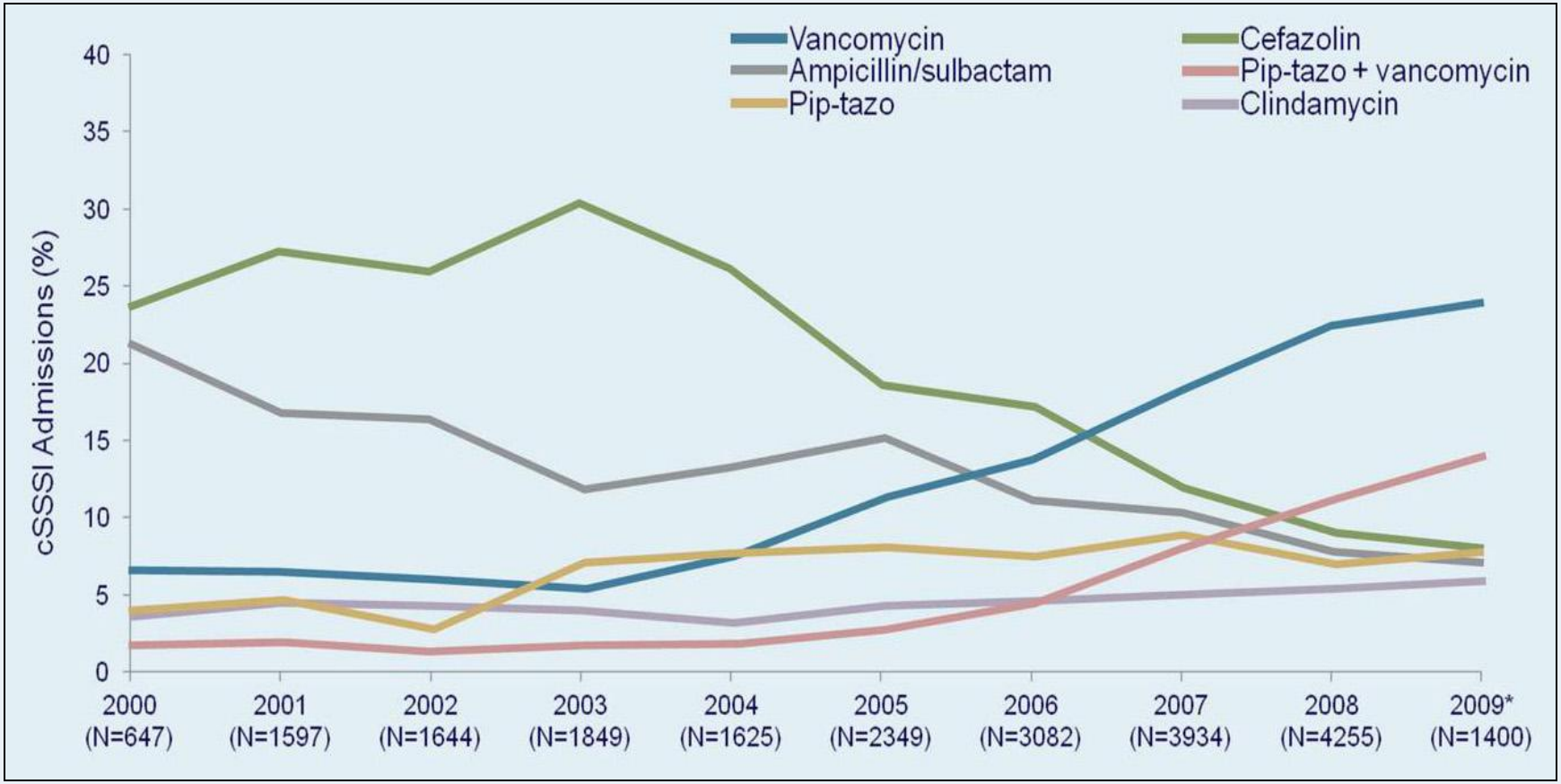
- The Infectious Disease Society of America guidelines for treating hospitalized patients with complicated skin and skin structure infection*
  - "Empirical therapy for MRSA should be considered" pending culture results

*cSSSI defined as deeper soft-tissue infections, surgical/traumatic wound infection, major abscesses, cellulitis, infected ulcers and burns

Liu C et al. *Clin Infect Dis*. 2011;52(3):285-292.

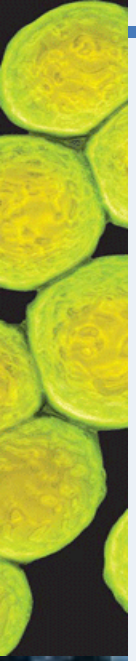
Antibiotic Use in ABSSSI

Vancomycin is used as initial therapy in 55% of ABSSSI



Study period January 1, 2000 to June 30, 2009.

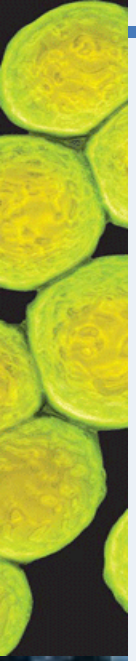
Berger A et al. Presented at: 48th Annual Meeting of the Infectious Diseases Society of America. October 21-24, 2010. Vancouver, Canada. Abstract L1-1761.



SSTIs Requiring Hospitalization at an Academic Medical Center: Opportunities for Antimicrobial Stewardship

- Evaluated cohort of consecutive adults hospitalized for SSSI during 1-year period (2007)
  - 477-bed academic medical center in Denver
- Classified as cellulitis, cutaneous abscess, or SSTI with additional complicating factors
- Results: 322 patients evaluated
  - 66 (20%): cellulitis
  - 103 (32%): abscess (incision and drainage in 98%)
  - 153 (48%): complicating factors
    - IV drug use, diabetes mellitus, alcohol use

Jenkins TC et al. *Clin Infect Dis.* 2010;51(8):895-903.

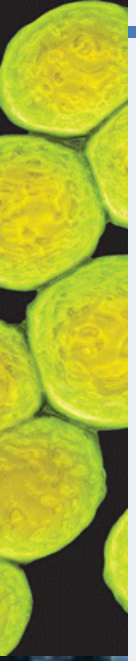


SSTIs Requiring Hospitalization at an Academic Medical Center: Opportunities for Antimicrobial Stewardship

- 150 patients had positive cultures from deep tissue, blood, or abscess
  - *S. aureus* or Streptococci identified in 145 (97%)
- Use of antibiotics
  - Broad aerobic gram-negative activity in 61%-80% of patients
  - Anaerobic coverage 73%-83% of patients
- Median duration of therapy, days
  - Cellulitis: 13 (IQR 10-14)
  - Cutaneous abscess: 13 (IQR 10-16)
  - SSSI with complications: 14 (IQR 11-17)
- Treatment failure, recurrence, rehospitalization within 30 days
  - Cellulitis: 12.1%
  - Cutaneous abscess: 4.9%
  - SSTI with complications: 9.2%

IQR, interquartile range.

Jenkins TC et al. *Clin Infect Dis.* 2010;51(8):895-903.

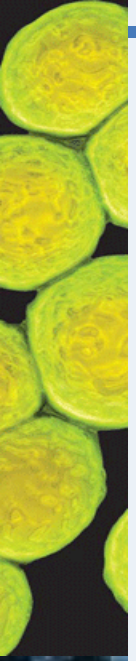


SSTIs Requiring Hospitalization at an Academic Medical Center: Opportunities for Antimicrobial Stewardship

- ESR and CRP determined in nearly 70% of patients
- Blood cultures 47% to 58% of the time
- Imaging studies in 94% of patients
  - SSTI with complicating factors: 86%
  - Significant association with use of plain film and cellulitis ($P < .04$)
  - Advanced imaging (CT, MRI) in 20% of all cases
  - Yield of imaging studies: 14 (4%)
    - 4 (1%): plain film; ultrasound: 1 (0.3%); CT: 7 (2%); MRI: 3 (1%)

ESR, erythrocyte sedimentation rate; CRP, C-reactive protein; CT, computed tomography.

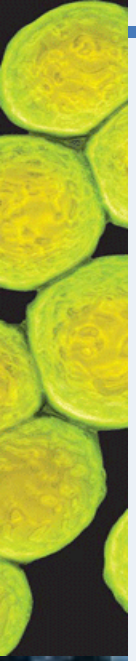
Jenkins TC et al. *Clin Infect Dis.* 2010;51(8):895-903.



SSTIs Requiring Hospitalization at an Academic Medical Center: Opportunities for Antimicrobial Stewardship

- Additional therapy results
  - 85% of cellulitis patients received MRSA coverage
    - Of these, approximately 50% discharged on TMP/SMX
    - Highest rate of failure was cellulitis
      - Of interest, 5/8 (63%) cases of cellulitis failure discharged on TMP/SMX
- Conclusions
  - Substantial health care resources used to treat SSTI
  - Some diagnostic testing is poorly defined, expensive, and unnecessary
  - Many patients received broad antibiotic coverage including gram-negative and anaerobic coverage
  - Duration of hospitalization for treatment appeared excessive and many patient could have received part of their therapy at home

Jenkins T et al. *Clin Infect. Dis.* 2010;(10):895-903.



Summary: Antimicrobial Stewardship Programs

- Driven by increasing antibiotic resistance
  - Limited pipeline
- Needs leaders and training programs
- Requires administration support
- Some components may be forced based on:
  - Future JCAHO and CMS requirements
- Requires evaluation of ASP impact
  - To improve and develop
  - Maintain services and resources

Q & A